

Light and Lighting

Official Journal
of the
Illuminating
Engineering
Society.

Incorporating
"The
Illuminating
Engineer."

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I'll Tell the World...

SCIENTISTS, technicians, experts, are apt to complain that they are underrated by the world, which takes small heed of their achievements and neglects the good advice they have to offer.

They should consider how little they often do to gain the ear of the world, how constantly they stop short at the acquiring of information and disregard their duty of making it widely known.

In his recent Presidential Address (p. 126) Mr. R. O. Ackerley reminded his hearers of the dual task of the I.E.S.—the promotion of the general advancement of illuminating engineering *and* the dissemination of knowledge relating thereto—and recalled the injunction of its first President, Professor Sylvanus P. Thompson—"Diffuse the Light."

After more than thirty years of study the Illuminating Engineering Society has a message to give to the world.

Let it not be afraid of delivering this message, nor of studying the means by which the people can be brought fully to understand what light has already done for the world, and how much more it can do in the future.

NOTES & NEWS ON



Light and Heat

At the risk of repetition in regard to "economies in lighting" we cannot refrain from quoting a judicious letter from a headmistress, Miss K. I. Sayers, which recently appeared in "The Times." She remarks that in a school of 300 residents, which is well, but not extravagantly lighted and averagely heated by central heating, the consumption of fuel units for lighting is only $2\frac{1}{2}$ per cent. of the annual total of fuel units for all purposes. The saving would therefore be almost negligible, "even if we went completely in the dark."

It is also justly remarked: "At present the emphasis on turning out the lights, advertised by many posters . . . is doubly mischievous; the people who turn out lights think they are affecting a valuable saving, which they are not (further, the effect of turning out a light is obvious to others and gives a self-righteous feeling) and the consequences of dimmed, lowered, or even switched-off lights on eye-strain, depression and minor, if not major injuries to the body, crockery, or anything else that is being moved about are overlooked."

By all means attack extravagance ruthlessly, but not mere good lighting, one of the cheapest benefits of civilisation to spirit and body, especially in these black-out days."

War-time Lighting Conference

The usual annual Convention of the Illuminating Engineering Society in the United States was this year replaced by the special Wartime Lighting Conference, held in St. Louis during September 21 and 22. The programme was devoted almost exclusively to lighting in relation to war effort, and the two dozen odd papers should make interesting reading when published. The initial session was concerned mainly with lighting in the interests of production and as a protection against sabotage, etc., the Technical Session included such topical items as the photometry and visibility of reflex reflectors and fluorescent and phosphorescent paints. The final session of the Defence Committee seems to have been particularly interesting in its bearing on present problems as the eight contributions all dealt with outdoor lighting, black-out precautions, etc. Coastal Dimouts, aircraft defence lighting, street and traffic signals were amongst the topics discussed. Of special interest is the final contribution on "Black-out Recommendations by the Army and Navy," dealt with jointly by Major W. S. Everett (Engineer Board U.S. Army) and Lieut.-Commander McRea Parker (U.S. Navy).

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Economy in Lighting

Shops, Hotels, Restaurants, etc.

In commenting on the case of the Strand Palace Hotel last month we emphasised the necessity for definite instructions to consumers in regard to the permissible consumptions of gas and electricity.

By the Emergency Power (Defence) Fuel Direction Order No. 1930, 1942, which came into force on October 1, specific indications were given as to the consumption that may be regarded as reasonable in shops, hotels, restaurants, places of entertainment or sports and meeting places.

It is specified that in such cases the consumption of electricity of lamps used shall not exceed in the aggregate per square foot of area illuminated any greater power than

(a) $1\frac{1}{2}$ watts in the case of:—

- (i.) every sale room, restaurant, and kitchen in any shop;
- (ii.) every dining room, kitchen, and public room (whether or not available for residents only) in any hotel;
- (iii.) every dining room, kitchen, and public room in any restaurant;

(b) 1 watt in the case of:—

- (i.) every other room (excluding any workroom) and part of any shop;
- (ii.) every other room and part of any hotel and restaurant;
- (iii.) every part of any place of entertainment or sport and meeting place.

As an indication of gas consumption the following schedule in regard to gas mantles is also given:—

Type of Gas Mantle.	Area illuminated per Mantle.	
	(a) sq. ft.	(b) sq. ft.
Bijou	30	40
No. 2 Cluster	45	60
Medium	45	60
Universal	75	100

There is, however, a concession in regard to theatres, etc. It is explained that the foregoing limits are not in-

tended to apply to gas or electricity consumed in illuminating any stage for projector lighting or for purposes essential for the performance of any entertainment or sport.

This Order defines the permissible consumption in the cases mentioned, but a reminder is given that there must also be compliance with the general provisions of the Waste and Fuel Order, 1942 (a).

It will be noted that the specific limitations are only imposed on the particular interiors mentioned. No effort is made to apply them to private houses, to offices or to factories (where illumination is naturally of great importance in relation to production and where minimum values of illumination are enforced by Order in the case of the great majority of premises engaged on national work).

In making adjustments to comply with the Order it may be suggested that a general diminution in lighting, rather than complete extinction in certain areas and bright lighting in others is to be preferred (except in cases where lighting is definitely required mainly at certain places, e.g., on counters in shops). Consumers may also be reminded of the advantage of making the fullest use of access of daylight. It is understood that a reduction in lighting very far below the prescribed standard is not expected, particularly on staircases, etc., where moderate lighting is essential in the interest of safety, and in places where the welfare of employees is an important consideration.

The authorities have doubtless acted wisely in basing these standards on the consumption of electricity or gas, rather than on illumination values, for the essential object of the Order is to limit consumption, not to diminish illumination, and it is manifestly easier in this case to assess the wattage of lamps used than to make measurements with an illumination photometer.

Moreover, when it is considered that 1 watt per square foot should yield on the average 3 ft.c., and may, in favourable circumstances, give considerably more, it will be seen that the requirements, whilst certainly involving some deprivation, are not unduly severe in present circumstances.

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(The numbers are those attached to individual entries in "Where to Buy")

I.E.S. Bath Group

About thirty-five members of the I.E.S. Bath Group recently visited a large factory in which about 4,000 fluorescent lighting fittings are installed. A feature of interest was the use of the new open-type reflector emitting a proportion of light upwards and preventing the so-called "tunnel effect."

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I.E.S. Honorary Membership

At the I.E.S. opening Sessional meeting on October 13 it was announced that the Council has elected Mr. J. S. Dow an honorary member of the Society. This rare distinction can only be granted once

in any year, and according to the rules of the Society no more than six honorary members can exist simultaneously. The only other honorary member is Mr. A. P. Trotter, whose early researches on photometry and illumination are known to all members.

Seeing is Believing

Notes on the I.E.S. Opening Sessional Meeting, held in London, on October 13, when Mr. R. O. Ackerley delivered his Presidential Address.

The lecture theatre of the E.L.M.A. Lighting Service Bureau was completely filled by an enthusiastic audience when Mr. R. O. Ackerley delivered his Presidential Address at the opening sessional meeting on October 13.

Before the address was delivered Mr. Ackerley referred in appreciatory terms to the good work done for the Society by his predecessor, Mr. W. J. Jones, and to the services as hon. treasurer of Mr. E. M. Murray during the past three years.

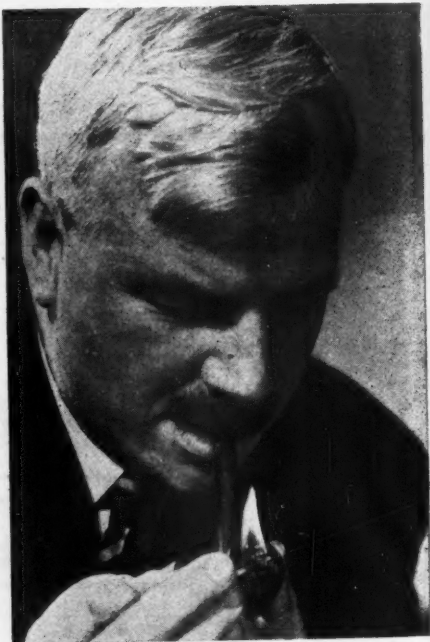
A pleasing event subsequently was the award of the Leon Gaster Memorial Premium to Mr. J. N. Aldington for his paper on "Fluorescent Light Sources and their Applications." The President also announced that the Council had elected Mr. J. S. Dow an honorary member of the Society and mentioned, as an illustration of its continued progress, that the number of corporate members was now approaching 1,000, the present statutory limit, and that powers were accordingly being taken to extend this to 2,000—which will presumably allow breathing space before another application becomes necessary!

"Diffusing the Light"

In opening his address Mr. Ackerley recalled the main objects of the Society as stated in its Memorandum, which included the "dissemination of knowledge" on illuminating engineering. Professor Sylvanus P. Thompson, the first President of the Society, in his inaugural address, also emphasised this duty, and concluded with the words, "The work before us is to diffuse light."

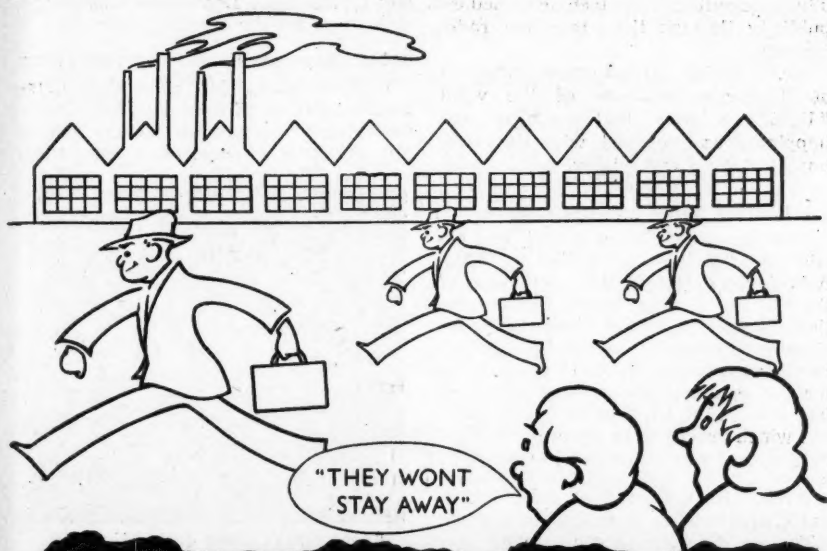
Proceeding, the President reviewed the Society's main activities, dwelling on its meetings, now greatly increased by

the work of the Centres and Groups, its Transactions and "Light and Lighting," and other channels for conveying information. As a cultural body the Society had a message to all concerned with lighting—including the layman, who must be convinced that he is a layman before he will listen to the experts! In this connection he quoted aptly the words of Mr. Ralph Tubbs, who remarked on the tendency of scholars and thinkers to progress out of sight of the people. He suggested that they should sometimes come back from the hill-top to join the people and show them where the leaders had gone. Other channels included contact with Government Departments, participation in the work of committees associated with



MR. R. O. ACKERLEY
(I.E.S. President, 1942-43)

Mr. Ackerley has been in charge of the G.E.C. illuminating engineering department since 1931 when he also became associated with the I.E.S. He is one of the Society's original Fellows, and for a number of years has taken a leading part in its development.



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other scientific and technical bodies, publicity through the Press and radio broadcasts.

Mr. Ackerley quoted many instances of the symbolical use of the word "light" to imply understanding and happiness, as compared with darkness, implying error and misery.

Lantern Slides and Illustrations

Coming next to the main subject of his address, "Seeing is Believing," Mr Ackerley emphasised the importance of the manner of presentation of information, whether printed or spoken. He instanced the case of one of the lighting reconstruction pamphlets in preparation for the Society, the contents of which had involved much "sweat and tears," but which proved to be generally acceptable, once it was assembled in type, with a good lay-out and with effective illustrations. He discussed at some length the characteristics desirable in lantern slides or diagrams accompanying lectures, showing a considerable number of slides, each bringing home some definite lesson. He showed, for example, the desirability of selecting pictures which quickly conveyed a message and arrested the attention of the audience, and the weakness of those which contained too much intricate detail, difficult to see or explain. Some of the slides showed effective means of illustrating the qualities of lighting fittings and installations, others were designed to convey convincingly some special idea. In the latter class were to be found the pictorial slide devised by Dr. Paterson, comparing the order of illumination in streets by night with higher values up to full daylight illumination by reference to the size of various objects ranging from the Himalayas down to a mole-hill, and the mole producing it. (He mentioned that Mr. Dow had carried the process a step further by adding to the picture a "speck of dirt" in the foreground, which illustrated, to scale, the intensity of war-time street lighting!) Another slide, aptly applying to the subject matter of the address, showed a "celestial chart of light-giving bodies," with the I.E.S. at the centre, linked to kindred scientific and technical bodies

and Government Departments, with the milky way for the general public.

Simple Experiments and Demonstrations

In conclusion, Mr. Ackerley illustrated the truth of the saying "Seeing is Believing" by a number of very simple but effective experiments, illustrating



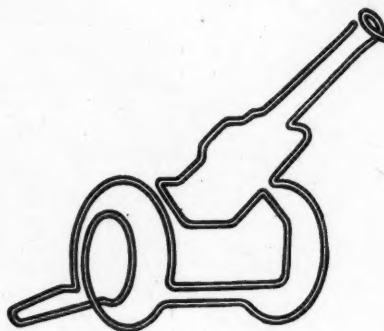
A photograph taken during the I.E.S. meeting on October 13, showing the President, Mr. R. O. Ackerley, standing in the audience.

fundamental principles of illumination. He repeated, for example, the familiar experiment of an illuminated disc attached to a gramophone motor and driven at varying speed, which appeared to move more slowly as the illumination was accentuated, and he showed how faintly drawn figures on a blackboard, invisible in weak illumination, could be easily seen at higher levels. Other experiments illustrated the influence of glare in depressing the power of perception of the human eye and the importance of shadow in revealing the shape of objects—the last illustrated by the case of a billiard ball which became an egg (and vice versa), when the method of lighting was altered.

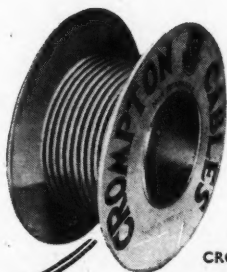
Following the address a hearty vote of thanks to the President was moved by Mr. C. I. Winstone and seconded by Mr. Howard Long, who mentioned that various Centres and Groups were looking forward to a repetition of this fascinating address.

A vote of thanks to the E.L.M.A. Lighting Service Bureau for their hospitality terminated the proceedings.

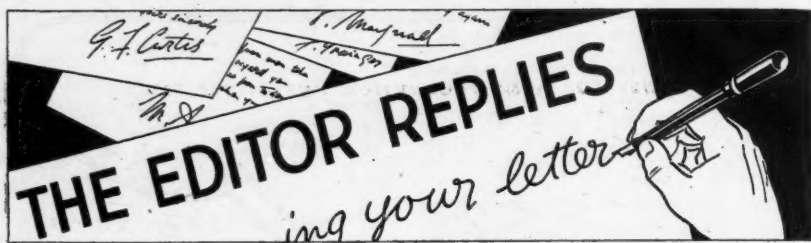
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I have been asked to give the substance of paragraph 2 (b) ii. in the **Waste of Fuel Order**, No. 1261, of 1942, to which reference was made in our last issue. Here it is:—

"Fuel shall be deemed not to have been used or consumed in such a manner as will effect all reasonable economy in its use or consumption . . . (ii) if any fitting or appliance which is being used in connection with or for the purpose of the use or consumption of fuel is not in such a condition as will ensure that it is being properly and efficiently used and reasonable steps have not been taken to put it in such a condition."

This clause evidently gives ground for action in cases where lighting fittings have been **imperfectly maintained** or allowed to fall into disorder. I have in mind certain enclosed diffusing ceiling fittings (presumably regarded as dust-proof) which I pass regularly on my daily journey. During weeks, or it may be months, of neglect a remarkable assortment of rubbish had collected on the lower flat surface. Suddenly, however, they have now been cleared out—with substantial gain to the local illumination. I have also the impression that something has been done to ginger up the lighting in carriages on the tube 1 frequent—at least during the rush hours. Although the illumination is naturally uneven, with only one in three lamps in operation, the average illumination seems definitely higher than it was.

My suggestions in regard to the "**black in problem**" have been aptly illustrated on one entrance staircase to a tube station from which daylight is almost completely excluded. An additional fitting over the stairs has been recently introduced. The extra illumination is probably not greater than 5 to 10 foot-candles—but it makes all the

difference. I have not had a chance yet of studying the effect with brilliant intense sunshine outside, but in all ordinary circumstances one now can see one's way clearly after entering—the more so because the lamp itself is completely screened from the view of those descending.

There has been complaint that some of the **Pictorial Advertisements** put out by the Authorities illustrate incorrect or obsolete methods of lighting. For example, Mr. Dean Chandler sends me a copy of the familiar "War Office at No. 16." The lady, engaged on the praiseworthy task of stimulating sales of National Savings Certificates, is shown working by the light of a portable lamp, rather too distant to illuminate properly the papers in front of her, and with the shade tilted to let out more light. The result does not comply with the maxim, "Light on the Object, not in the Eye," for the lady's face is brilliantly illuminated and she must be suffering acutely from glare.

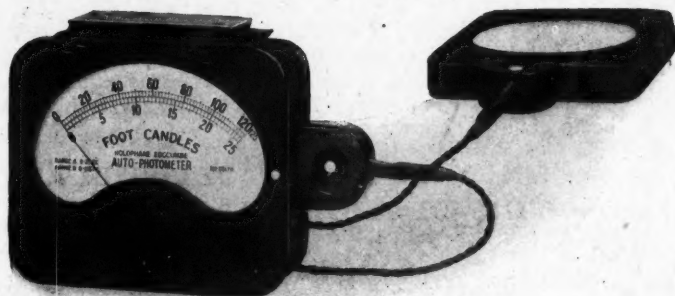
There was a numerical error in the reference to War Time Street Lighting or "**Standard Starlight Illumination**," as Mr. Ward Harrison suggests in our last issue (p. 116). The value is, of course, **0.0002 ft.-c.**, and 0.02 ft.-c. would thus be 100 S.S.I., as correctly stated. It is one of the drawbacks of working with such very low illuminations that 0's are so easily allowed to slip in or to fall out.

I have received a copy of "South African Engineering" in which the effect of the diminished lighting on the Underground railways in London is mentioned. It is remarked by a correspondent that, although fuel economy is essential, there is no necessity to make a virtue of gloom, and that "morale should be stimulated, not depressed."

So far this correspondent will doubt-

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less find a good measure of support, but he is on less secure ground when he goes on to declare that the dim lighting is made much more exacting by the "obscuring globes" which are "quite unnecessary and probably cut off 40 per cent. of the light."

This is going back to the early days of railway lighting when the old brigade were apt to inveigh against glassware or reflectors of any kind, urging that the "light should be let out," irrespective of direction and diffusion. It is a pity that opal globes, the function of which is to diffuse the light, should be so often described as "obscuring." No doubt some little loss of light is occasioned by their use, but I should doubt very much whether, in clean condition, they would absorb anything like 40 per cent. In any case rows of unshaded filaments would not constitute any real improvement, for any gain in illumination being offset by the unsightly and disturbing effect of glare.

I have been asked whether it is true, as reported in the Press, that 500,000

lamp posts are to be scrapped for conversion into munitions. I should doubt it. Most local authorities would, I imagine, be very loath to be left with no facilities for quick restoration of lighting when the war is over—and if there were no posts left there would certainly be an interregnum before any effective measure of street lighting could be restored. In any case one could scarcely conceive that posts at present serving to furnish war-time street lighting would be destroyed before the war is over—and some amelioration of present conditions might become feasible and desirable even before then. In any case one imagines that posts at present serving to furnish war-time street lighting would scarcely be removed.

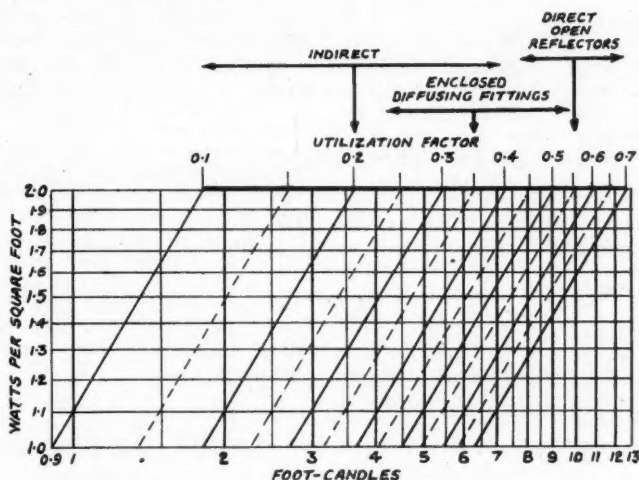
On the other hand, taking a long view, the necessity of redesigning most of our installations might be no bad thing. We have learned a great deal since most of the present posts were installed. Designers could work more freely if they were no longer tied down to the present spacing and siting.

A Chart for Determining Foot-Candle Values

The illumination resulting from any particular lighting installation can be calculated with precision if the various factors are known. In the familiar E.L.M.A. handbook (Illumination Design Data No. 2 E) comprehensive tabular

per watt from lamps yielding initially 13 lumens per watt.

The ingenious chart here presented, which has been devised by Mr. H. C. Weston, enables an estimate of illumination to be quickly and simply made. It will be seen that the chart takes account of the main factor determining the illumination, i.e., the mode of lighting (whether direct, diffusing, or indirect),



(This chart assumes the use of tungsten 60-200 watt lamps, operating at 13 lumens per watt, equivalent to 9 lumens per watt after allowing for depreciation.)

data are presented enabling such calculations to be made and facilitating the estimation of the utilisation factor for various types of fittings, taking into account the nature of the surroundings and in particular their reflecting power. Once the wattage corresponding to a certain illumination has been ascertained it is customary to allow for depreciation by applying the multiplying factor 1.43. This is done here by assuming a contribution of only 9 lumens

but it assumes average conditions in regard to reflection from surroundings such as walls and ceiling.

The diagram should be of special utility to consumers interested in compliance with the recently introduced Control of Fuel Order, No. 1930 (see p. 124). The diagram shows that, on the average, 1 watt per square foot should yield about 3 ft.c., and $1\frac{1}{2}$ watts $4\frac{1}{2}$ ft.c., whilst in favourable circumstances considerably more may often be obtained.

The Colour Group

At the ninth meeting of the Colour Group of the Physical Society, held on September 11, the unusual course was taken of arranging for a lecture and discussion addressed not only to members of the Group but also to members of the Science Masters' Association and the National Society of Art Masters. The lecturer was Mr. E. G. Savage, the education officer of the L.C.C., who took as his subject "The Teaching of Colour in Schools."

"Children," said Mr. Savage, "are very interested in colour. A favourite question asked is the reason for the blue colour of the sky." He then went on to say that most people approaching the subject of colour naturally assumed that white was the simple thing and colour the more complex. The first thing to be demonstrated, then, was the falsity of this notion and the fact that white could be decomposed. Then there was the natural tendency to think that when white light passed through a colour filter it had something added to it to make it, say, blue. All these and many other facts of colour could be brought out by suitable demonstrations, and Mr. Savage showed how the two types of colour mixture, additive and subtractive, could be clearly shown. Such phenomena of colour vision as after-images and the effect of a colour background in changing the appearance of a patch of colour in the centre of a large screen were also clearly demonstrated by the lecturer.

An interesting discussion followed, several speakers voicing their opinions as to the correct use of the term "primary colours." The general lack of understanding of colour, even among those who might be expected to have some training in the subject (e.g., architects), was emphasised.

After a tea interval a paper entitled "A Photoelectric Tricolorimeter" was read by Messrs. E. G. Knipe and J. B. Reid, of Kodak's. They described an instrument designed primarily to measure the colour of nearly white papers, although it could be used universally. A double monochromator system was employed, with three diaphragms to select

the correct proportions of the lights of each wave-length, so that the results were given directly in C.I.E. units. The reading of the paper was followed by an interesting discussion, largely on points of technical detail.

Lighting Reconstruction in Nottingham

Mr. C. S. Caunt, the hon. secretary of the I.E.S. Nottingham Centre, has sent us some particulars of the Post-War Reconstruction Conference, held last month under the auspices of the Nottingham Society of Engineers. The series of addresses covered a wide ground, such topics as building construction, coal and the industry, domestic heating and ventilating, electricity, gas, lighting, welfare in industry, roads, refuse and sewage, transport and water supply being briefly handled.

We are interested to see that Mr. R. Gillespie Williams dealt with the topic of lighting, and that two other leading members of the Nottingham Centre, Mr. Geo. Dixon and Professor H. Cotton, dealt respectively with gas and electricity.

Scottish Lighting Service Bureau

The E.L.M.A. Lighting Service Bureau of Scotland came into being in Glasgow in 1925, since when it has developed steadily. During the years preceding the war about 800 lectures were given to 45,000 people, and facilities for demonstration have been improved and extended on several occasions. The demonstration rooms have recently been reconstructed to illustrate the various factory lighting regulations. Levels of illumination up to 100 ft.c. can be readily demonstrated, and all possible space has been utilised for demonstrations and pictorial illustrations of modern lighting practice.

A new exhibition was opened under the supervision of the district engineer, Mr. M. W. Hime, on September 30.

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